Supplementary Data1 Spatial-Cueing Paradigm (#19240)

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1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
We examine a dissociation between conscious and non-conscious processing in human adults. Adults performance in this experiment will be compared to performance of non-human animals (e.g., dogs and monkeys) and human Children in other experiments. We predict that human adults will show conscious and non-conscious dissociations in their performance. Specifically, we predict that participants in the conscious condition will mostly be faster by using the incongruent cue, while participants in the non-conscious incongruent condition will mostly be slower and hindered by the cue. We will test the facilitation effect and the interference effect in comparison to few control baseline trials that will be integrated within the block and consist of two cues (20% of trials) that bare no informative information towards the target location. We thus predict that participants in the conscious condition will be faster on the incongruent cue than the two-cues baseline control cue, whereas in the non-conscious condition we expect the reverse that the single incongruent cue will be slower than the two-cues baseline control cue. We anticipate that the facilitation in the conscious condition will take time to develop and will increase over time, after starting rather with an interference for the single incongruent cue, thus showing a gradual learning slope. In contrast, we anticipate that most participants in the non-conscious condition will overall not improve their performance compared to baseline effectively within the duration of the task, unless if participants will become aware of the subliminal cue locations as attested by their self-reports or objective test. Yet we anticipate this situation will be rare. We predict that most participants will show the predicted opposite performance dissociation, but differences in size of this dissociation may exist in the different modalities tested, and with the different non-conscious intervals used. We anticipate that error rates will be minimal, yet if they happen to be considerably high, we anticipate that in error rates too, participants in the conscious condition will eventually (after learning) have fewer errors than the baseline while participants in the non-conscious condition will have more errors than the baseline.

3) Describe the key dependent variable(s) specifying how they will be measured.
The dependent variables will be reaction time and error rates. Participants will be presented with a target (a treasure chest) presented either on the left/right sides of the screen in a location that is always incongruent with the single cue that appears before the target (or orthogonal with respect to a two star cue control). Participants must respond as quickly and accurately as possible to the side the target appeared using the computer keys and the response time and error rates will be measured. We will also use a second measure of verbal response strategy. Participants will be asked at the end of the experiment if they have used any strategy to complete the task, and we will count the number of participants reporting to strategically go to the opposite of the cue in the conscious incongruent conditions and in the non-conscious incongruent conditions. We will also ask if participants were aware of seeing stars in the conscious and non-conscious conditions, and ask if they used these stars in any way to help them, and how many stars did they see, and also include an objective identification task of the starts origin to identify conscious participants.

4) How many and which conditions will participants be assigned to?
We will test participants in two conditions (a) Non-conscious incongruent and (b) Conscious incongruent, in two modalities (key-press or with eye tracking), and with two different non-conscious intervals (17ms or 33ms) and with two types of error restriction (incorrect target choice is accessible, and with incorrect target choice blocked) . In each of these, 80% of trials will be with a one-star cue that is incongruent with the target, and 20% with two stars that are orthogonal with the target. Both the conscious and non-conscious conditions will be presented within participants, as well as the two incorrect choice restricted/accessible. And the two modalities and intervals will be allocated equally between participants

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
(a) We will compare the reaction time of a conscious incongruent cue with the non-conscious incongruent cue.
(b) In addition, In each of the conditions (conscious and non-conscious) separately, we will compare the reaction time to respond with the incongruent single cue vs. the two cues we will also test the interaction between the two conditions (conscious vs. non-conscious) and cues (one vs. two) as predictive of a dissociation.
(c) we will additionally plot the reaction time learning curves over blocks of trials and fit a model that best describes the learning (e.g., linear, exponential or other). After fitting the model, we will estimate the learning slopes and compare the slopes of children performing in the conscious condition with the non-conscious condition.
(d) We will perform the above analyses for error rates too. Though we anticipate these will be minimal/negligible. If error rates will show speed accuracy trade off (e.g., have faster RT in the conscious incongruent condition but also more error rates) that will make interpretation of RT data difficult, we will analyze separately the two different modes of response (with or without incorrect target blocked). If there will be no noticeable speed accuracy tradeoffs,

we will pool the two modes together.
(e) We will analyze and compare differences in results between the two response modalities and two non-conscious intervals, and pool them together if overall the qualitive effects are in the same direction.
Since we anticipate that learning to use the incongruent cues for an RT benefit will be gradual (i.e., start rather with an interference and gradually improve to facilitation) we will test these effects in quartiles across the learning curve – here divided by the blocks of trials in the task. These will include – last quarter of trials (last block); last half of trials (last two blocks); last ¾ of trials; and across all trials.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
(a) Participants non-conscious condition data will be excluded if they score 61% or more in the conscious objective awareness test to the non-conscious cues.
(b) Participants will be excluded if they fail to complete at least half of the task.
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(c) We will exclude trials with reaction times that are slower of faster than 2 standard deviations of the mean of the specific block for each participant.
(d) Participants will be excluded if having less than 75% of valid non-excluded trials in a given condition.
(e) Participants who will report to have used a strategy to go to the opposite of the cue in the non-conscious condition (which is supposed to be invisible and non-conscious to them) will be excluded.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.
We are willing to test up to 64 participants. However, because this might represent an unnecessarily expenditure of resources we will use a sequential testing design1. Thus, we will test a minimum of 32 participants (16 in each response modality, and among these 16 in each non-conscious interval). Once this minimum number of participants has been obtained we will test for our effect using a p-value corrected for sequential testing in 3 time points calculated via the GroupSeq package in R based with Hwang-Shih-DeCani family correction with a phi of 1; for example, if we test the minimum of 16 + 16 participants across all or in each response modality/interval at the first time point this will require $p < .0311$ to confirm our hypothesis and stop testing. If we do not reach this alpha we can continue for time point t2 with 75% of our maximum participants -- 24 participants in the modality/interval desired (or 48 for the overall effect) with the specified corrected alpha of t2 <.0229. or finally if required we will test at the last time point t3 with our maximum set number of participants - 32 in one of the intervals/modalities or 64 for the overall effect with a corrected alpha of $p < .0218$. Thus for each modality or interval and across all conditions we will have 3 time point windows to test our effect with the aforementioned penalized alphas (1st with 50% of max participants; 2nd with 75% of max participants; and last 100% of max participants). Thus we may result in an uneven number of participants in each modality/interval in case the effect was not-significant in the 1st or 2nd time points. For the overall conditions effect, once we reach the minimum of 32 participants, if needed to continue for the 2nd/3rd time point of testing, we may choose to continue running the remaining participants with the interval/modality that worked best on participants (as our wish to compare the different modalities/intervals is not the focal point of the study, but rather to test the existence of a dissociation in humans in this novel task with the optimal conditions for participants).

1. Lakens D (2014) Performing high-powered studies efficiently with sequential analyses. European Journal of Social Psychology 44, 701–710. DOI: 10.1002/ejsp.2023

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
Nothing else to pre-register.